**0.3c Class Activity: Dividing Muli-Digit Decimals**

Roxy has bins of loose candy at her shop. She sells Creamy Dreamies for $0.75 each, Sour Powers for $0.25 each and Gummy Yummies for $0.05 each. She has also decided to sell bags of each different kind of candy for $3.00 a bag. How many of each candy will be in a $3.00 bag? Draw a model to find your answers.

Creamy Dreamies $3.00

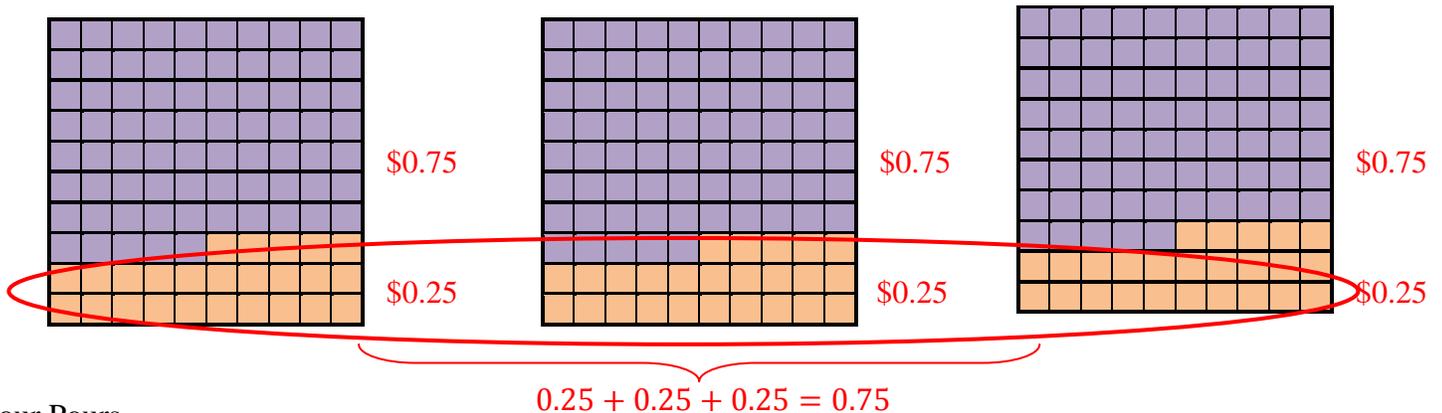Sour Powers $3.00

Gummy Yummies $3.00

Creamy Dreamies

Students must first recognize that this problem can be solved by dividing the total cost of the bag of candy by the individual cost of each candy. However, they may not know how to divide when the divisor is a decimal. Ask students to see if they can figure out the number of each kind of candy by drawing a model.
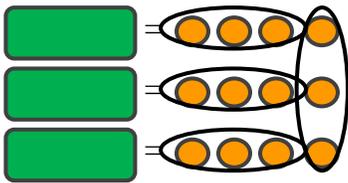
This shows that if bag of Creamy Dreamies cost $3.00, and an individual Creamy Dreamie cost $0.75 we can break up each dollar into quarters and see that there are 4 groups of $0.75 in $3.00.

Another way to model this problem is by using base-ten models. Using a base-ten model will help them when they get to the bag of Gummy Yummies because they have to split their dollars into pennies. You could provide students with base-ten blocks or graph paper to draw their models. We can think of the 10 x 10 model as $1.00 or 100 hundredths. How many groups of $0.75 or 75 hundredths are in $3.00?
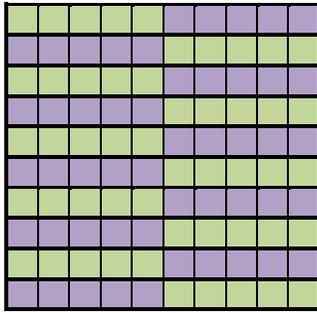
$0.75

$0.25

$0.75

$0.25

$0.75

$0.25

$$0.25 + 0.25 + 0.25 = 0.75$$

Sour Pours

How many groups of $0.25 or 25 hundredths are there in $3.00?

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

$0.25

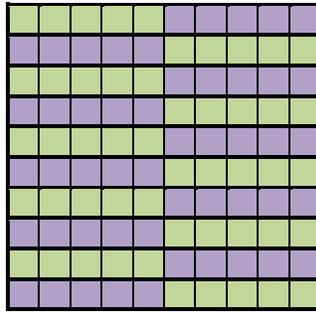$0.25

4 groups of $0.25

4 groups of $0.25
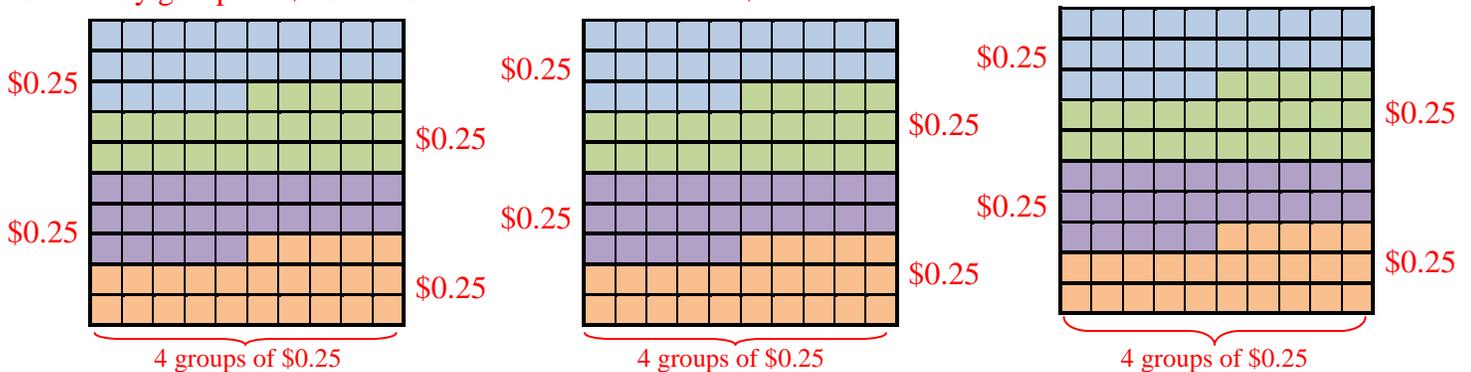
4 groups of $0.25

Each $1.00 has 4 groups of $0.25 so altogether there are 12 groups of $0.25. Thus there are 12 Sour Powers in $4.00 bag.

Gummie Yummies
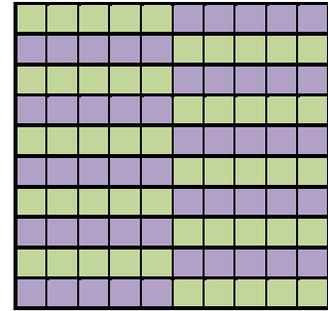How many groups of $0.05 or 5 hundredths are there in $3.00?

20 groups of $0.05   20 groups of $0.05   20 groups of $0.05

Each $1.00 has 20 groups of $0.05 so altogether there are 60 groups of $0.05.

Is there a way that you can find the number of Gummy Yummies in a bag without drawing model?
The following discussion questions can help students understand why they can multiply the dividend and divisor by the same power of ten and then use the division algorithm to arrive at their quotient.

What if you thought of each dollar as 100 hundredths, how many one hundredths would 3 dollars be?
$3 \times 100 = 300$. There would be 300 hundredths.
Similarly how many one hundredths are there in 5 hundredths? There are $0.05 \times 100 = 5$.
So we would be dividing 300 by 5 and $300 \div 5 = 60$.

In other words when you multiply the dividend and the divisor both by 100 and then divide with the long division algorithm you get the same quotient.
$$3 \times 100 = 300$$
$$0.05 \times 100 = 5$$
$$300 \div 5 = 60$$

Another way to look at this is by writing the divisor and dividend as fractions. For example $3 \div 0.05 = \frac{3}{0.05}$, now what fraction can you multiply this by so that the denominator is a whole number? This fraction is $\frac{100}{100}$. Thus $\frac{3}{0.05} \cdot \frac{100}{100} = \frac{300}{5} = 60$.

Try your method with Creamie Dreamies and the Sour Powers to see if you get the same answer.
Ask students to multiply the divisor and dividend each by 100 or change it to a fraction and multiply by 100 and then divide.

Creamie Dreamies
$3 \times 100 = 300$
$0.75 \times 100 = 75$
$300 \div 75 = 4$

$3 \div 0.75 = \frac{3}{0.75} \times \frac{100}{100} = \frac{300}{75} = 4$

Sour Powers
$3 \times 100 = 300$
$0.25 \times 100 = 25$
$300 \div 25 = 12$

$3 \div 0.25 = \frac{3}{0.25} \times \frac{100}{100} = \frac{300}{25} = 12$

It might help students to better understand why they are getting the same quotient even though they changed the numbers by illustrating with whole numbers. For example if you have 8 pieces of candy to distribute amongst 4 friends, each friend will get 2 pieces of candy. If you now multiply 8 and 4 by the same number, say 10. $8 \times 10 = 80 \ and \ 4 \times 10 = 40$, this would be as though you had 80 pieces of candy to distribute amongst 40 friends. How much would each friend get? $80 \div 40 = 2$. Each person would still get two pieces of candy. When we are dividing we are trying to determine the number of groups, so you will get the same answer if you multiply the dividend and divisor by the same amount. This is true for decimals as well as illustrated with the $3.00 bags of candy.

Directions: For each problem determine what number you can multiply the dividend and divisor by so that you get a whole number divisor. If needed re-write each division problem as a fraction. Then re-write each quotient with a whole number divisor.

As you work through these problems help students to remember how multiplying by a power of ten moves the decimal point. Some discussion questions are below.
When you multiply the dividend and divisor each by ten how many spaces does the decimal point get moved?
1 space to the right.
When you multiply the dividend and divisor each by 100 how many spaces does the decimal point get moved?
2 spaces to the right
When you multiply the dividend and divisor each by 1000 how many spaces does the decimal point get moved?
3 spaces to the right.

1. $63 \div 3.5 =$ $\dfrac{63}{3.5} \times \dfrac{10}{10} = \dfrac{630}{35} = 630 \div 35$	2. $603 \div 50.25 =$ $\dfrac{603}{50.25} \times \dfrac{100}{100} = \dfrac{60300}{5025}$ $= 13000$ $\div 5025$	3. $18.2 \div 1.4 =$ $\dfrac{18.2}{1.4} \times \dfrac{10}{10} = \dfrac{182}{14} = 182 \div 14$
4. $0.75 \div 0.15 =$ $\dfrac{0.75}{0.15} \times \dfrac{100}{100} = \dfrac{75}{15} = 75 \div 15$	5. $1{,}488 \div 0.024 =$ $\dfrac{1488}{0.024} \times \dfrac{1000}{1000} = \dfrac{1488000}{24} =$ $1488000 \div 24$	6. $36.47 \div 0.7 =$ $\dfrac{36.47}{0.7} \times \dfrac{10}{10} = \dfrac{364.7}{70} =$ $364.7 \div 70$
7. $0.52 \div 0.001 =$ $\dfrac{0.52}{0.0013} \times \dfrac{1000}{1000} = \dfrac{5200}{13} =$ $5200 \div 13$	8. $0.987 \div 12.3 =$ $\dfrac{0.987}{12.3} \times \dfrac{10}{10} = \dfrac{9.87}{230} =$ $9.87 \div 230$	9. $4.23 \div 0.012 =$ $\dfrac{4.23}{0.012} \times \dfrac{1000}{1000} = \dfrac{4230}{12} =$ $4230 \div 12$

Now re-write each problem as a quotient with a whole number divisor by moving the decimal points. Check to see if it matches the quotient you wrote above. Then calculate each quotient.

10. $63 \div 3.5$ $63.0 \div 3.5$ $= 630 \div 35$ $= 18$	11. $603 \div 50.25$ $603.00 \div 50.25$ $= 60300 \div 5025$ $= 12$	12. $18.2 \div 1.4$ $18.2 \div 1.4$ $= 182 \div 14$ $= 13$

13. $0.75 \div 0.15$ $0.75 \div 0.15$ $= 75 \div 15$ $= 5$	14. $1,488 \div 0.024$ $1488.000 \div 0.024 =$ $1488000 \div 24 =$ 6200	15. $36.47 \div 0.7$ $36.47 \div 0.7 =$ $364.7 \div 7 =$ 52.1
16. $0.52 \div 0.001$ $0.520 \div 0.001$ $= 520 \div 1$ $= 52$	17. $0.987 \div 10.5$ $0.987 \div 10.5 =$ $9.87 \div 105 =$ 0.094	18. $4.23 \div 0.012$ $4.230 \div 0.012 =$ $4230 \div 12 =$ 352.5

Explain in your own words how to divide decimals by decimals

To divide a decimal by a decimal
Multiply the divisor and dividend by the same power of ten to make the divisor a whole number. Then place the decimal point in the quotient and divide as you would with whole numbers. Continue until there is no remainder.